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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/691,826	10/22/2003	Anand Subramaniam	020680	6346

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QUALCOMM INCORPORATED
5775 MOREHOUSE DR.
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EXAMINER

WILLIAMS, LAWRENCE B

ART UNIT PAPER NUMBER

2611

DATE MAILED: 12/13/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/691,826

Applicant(s)

SUBRAMANIAM ET AL.

Examiner

Lawrence B. Williams

Art Unit

2611

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 2 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 22 October 2003.
- 2a) ☐ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☒ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☒ Claim(s) 1-15 and 18 is/are allowed.
- 6) ☐ Claim(s) _____ is/are rejected.
- 7) ☒ Claim(s) 16-17, 19-24 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 22 October 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Specification

1. The specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is requested in correcting any errors of which applicant may become aware in the specification.

Claim Objections

2. Claim 16 is objected to because of the following informalities: The examiner suggests applicant place the appropriate punctuation at the end of line 2 of the claim.

Appropriate correction is required.

3. Claim 19 is objected to because of the following informalities: The examiner suggests applicant place the appropriate punctuation at the end of line 8 of the claim.

Appropriate correction is required.

4. Claim 22 is objected to because of the following informalities: The examiner suggests applicant place the appropriate punctuation at the end of line 13 of the claim.

Appropriate correction is required.

Allowable Subject Matter

5. Claims 1-15 and 18 are allowed.

6. Claims 16-17, 19-21, 22-24 would be allowable if rewritten to overcome the objections cited above.

7. The following is a statement of reasons for the indication of allowable subject matter: The instant application discloses a method and apparatus for deriving an estimate of a wireless channel in a wireless communication system. A search of prior art records has failed to teach or suggest alone or in combination:

“a method for deriving an estimate of a wireless channel in a wireless communication system, comprising: obtaining an intermediate vector derived based on K sub-vectors of a vector for a first channel estimate and at least two discrete Fourier transform (DFT) sub-matrices for a DFT matrix, wherein the DFT matrix corresponds to the vector for the first channel estimate and K is an integer greater than one; obtaining an intermediate matrix for the DFT matrix; and deriving a second channel estimate based on the intermediate vector and the intermediate matrix” as disclosed in claim 1.

“a method for deriving a channel estimate in a wireless channel in a wireless communication system, comprising: obtaining an intermediate vector derived based on K sub-vectors of a vector for a first channel estimate and K discrete Fourier transform (DFT) sub-matrices of a DFT matrix, where K is an integer greater than one; obtaining an intermediate matrix based on the K DFT sub-matrices; and deriving a second channel estimate based on the intermediate vector and the intermediate matrix” as disclosed in claim 15.

“a method for deriving an estimate of a wireless channel in an orthogonal frequency division multiplexing (OFDM) communication system, comprising: forming a first matrix for an initial frequency response estimate of the wireless channel; computing discrete Fourier transforms (DFTs) of the first matrix to obtain a second matrix; computing inner products between a base DFT sub-matrix and the second matrix to obtain an intermediate vector; obtaining an intermediate matrix derived for a DFT matrix for the initial frequency response estimate; and deriving a channel impulse response estimate based on the intermediate vector and the intermediate matrix” as disclosed in claim 16.

Nor does the prior art teach or suggest:

“a memory communicatively coupled to a digital signal processing device (DSPD) capable of interpreting digital information to: obtain an intermediate vector derived based on K sub-vectors of a vector for a first channel estimate and at least two discrete Fourier transform (DFT) sub-matrices for a DFT matrix, wherein the DFT matrix corresponds to the vector for the first channel estimate and K is an integer greater than one; obtain an intermediate matrix for the DPT matrix; and derive a second channel estimate based on the intermediate vector and the intermediate matrix” as disclosed in claim 18.

“an apparatus operable to derive an estimate of a wireless channel, comprising means for obtaining an intermediate vector derived based on K sub-vectors of a vector for a first channel estimate and at least two discrete Fourier transform (DFT) sub-matrices for a DFT matrix, wherein the DFT matrix corresponds to the vector for the first channel estimate and K is an integer greater than one; means for obtaining an intermediate matrix for the DFT matrix; and

means for deriving a second channel estimate based on the intermediate vector and the intermediate matrix” as disclosed in claim 19.

“a device in a wireless communication system, comprising: a demodulator operative to receive a pilot transmission on a group of designated subbands; and a processor operative to obtain a first channel estimate for the group of designated subbands based on the received pilot transmission, obtain an intermediate vector derived based on K sub-vectors of a vector for the first channel estimate and at least two discrete Fourier transform (DFT) sub-matrices for a DFT matrix, wherein the DFT matrix corresponds to the vector for the first channel estimate and K is an integer greater than one, obtain an intermediate matrix for the DFT matrix, and derive a second channel estimate based on the intermediate vector and the intermediate matrix” as disclosed in claim 22.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled “Comments on Statement of Reasons for Allowance.”

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

a.) Vaidyanathan discloses in US 2004/0248604 A1 Compensation Techniques For Group Delay Effects in Transmit Beamforming Radio Communication.

b.) Vaidyanathan discloses in US 2006/0258403 A1 Compensation Techniques For

Group Delay Effects in Transmit Beamforming Radio Communication.

c.) Goren et al. discloses in US 2004/0243657 A1 Vector-Matrix Multiplication.

d.) Kechriotis discloses in US 6,839,727 B2 System and Method for Computing a Discrete Transform.

e.) Krishnan et al. discloses in US Patent 7,039,001 B2 Channel Estimation for OFDM Communication Systems.

9. This application is in condition for allowance except for the following formal matters:

a.) Claim objections as noted above.

Prosecution on the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

A shortened statutory period for reply to this action is set to expire **TWO MONTHS** from the mailing date of this letter.

10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Lawrence B Williams whose telephone number is 571-272-3037. The examiner can normally be reached on Monday-Friday (8:00-6:00).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ghayour Mohammad can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

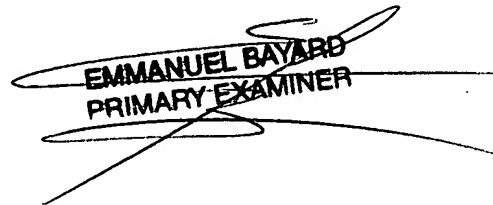
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Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Lawrence B. Williams


lbw

December 4, 2006


EMMANUEL BAYARD
PRIMARY EXAMINER